

**Maricopa County
Department of Public Health**



2009 Outbreak Summary Report

**Office of Epidemiology
April 2010**

Introduction

The purpose of this report is to provide a general overview of the disease outbreak investigations that were reported during 2009 in Maricopa County, Arizona. In Arizona, health care providers (HCP), health care institutions (HCI), correctional facilities (CF), childcare establishments (CCE), administrators of schools, and shelters are all required to report outbreaks of infectious diseases to the Maricopa County Department of Public Health (MCDPH) under Arizona Administrative Code A.A.C. R9-6-203 and ARS Title 36. Outbreaks involving certain diseases require that facilities notify the health department within 24 hours in the event of an outbreak. In addition, operators of hotels, motels, and resorts are required to report contagious, infectious, or epidemic diseases occurring in their establishments within 24 hours under Arizona Revised Statutes Title 36, Chapter 6, Article 2. The diseases requiring outbreak notification within 24 hours are shown in Table 1.

Table 1. Diseases requiring outbreak notification within 24 hours in Arizona		
Disease/Condition	Reporting by HCPs, HCIs, and CFs	Reporting by Schools, CCEs, and Shelters
Amebiasis	X	
Campylobacteriosis	X	
Conjunctivitis: acute	X	X
Cryptosporidiosis	X	
Diarrhea, Nausea, or Vomiting	X	X
Giardiasis	X	
Hepatitis A	X	
Hepatitis E	X	
Salmonellosis	X	
Scabies	X	X
Shigellosis	X	
Streptococcal Group A Infection		X
Taeniasis	X	
Vibrio Infection	X	
Yersiniosis	X	

Note: Keepers of private houses, boarding houses, lodging houses, inns, or hotels are required to report each case of contagious, infectious, or epidemic disease in their establishments.

Investigation Methodology

MCDPH investigates outbreaks in order to stop the spread of disease quickly, identify the source of disease, and prevent future outbreaks. MCDPH also investigates single case reports of communicable diseases, which often leads to the identification of additional cases that may turn out to be part of an outbreak. Educational materials are provided to the public in order to help stop transmission and inform about safe practices. MCDPH investigates outbreaks in conjunction with other agencies in Maricopa County such as the Maricopa County Department of Environmental Services (ES). Many outbreak investigations require the assistance of the Arizona Department of Health Services (ADHS), especially when laboratory services are necessary. When indicated and if possible, MCDPH staff

members collect biological and environmental specimens as part of these investigations to obtain precise laboratory information and facilitate intervention. All outbreak reports are submitted to ADHS and then forwarded to the Centers for Disease Control and Prevention (CDC). These individual outbreak reports are available by request.

Due to limited resources, MCDPH cannot investigate all outbreaks that are reported. MCDPH nurses and epidemiologists conduct risk assessments to weigh several factors to determine if an outbreak will be investigated. The following factors are examined for each outbreak to determine whether an investigation should occur:

- Number of people ill
- Severity of illness
- Whether or not the outbreak resulted in hospitalizations and/or deaths
- Timely reporting
- Ability to test specimens
- The level of vulnerability of affected individuals
- Type of facility
- The degree to which the outbreak is under control

Summary

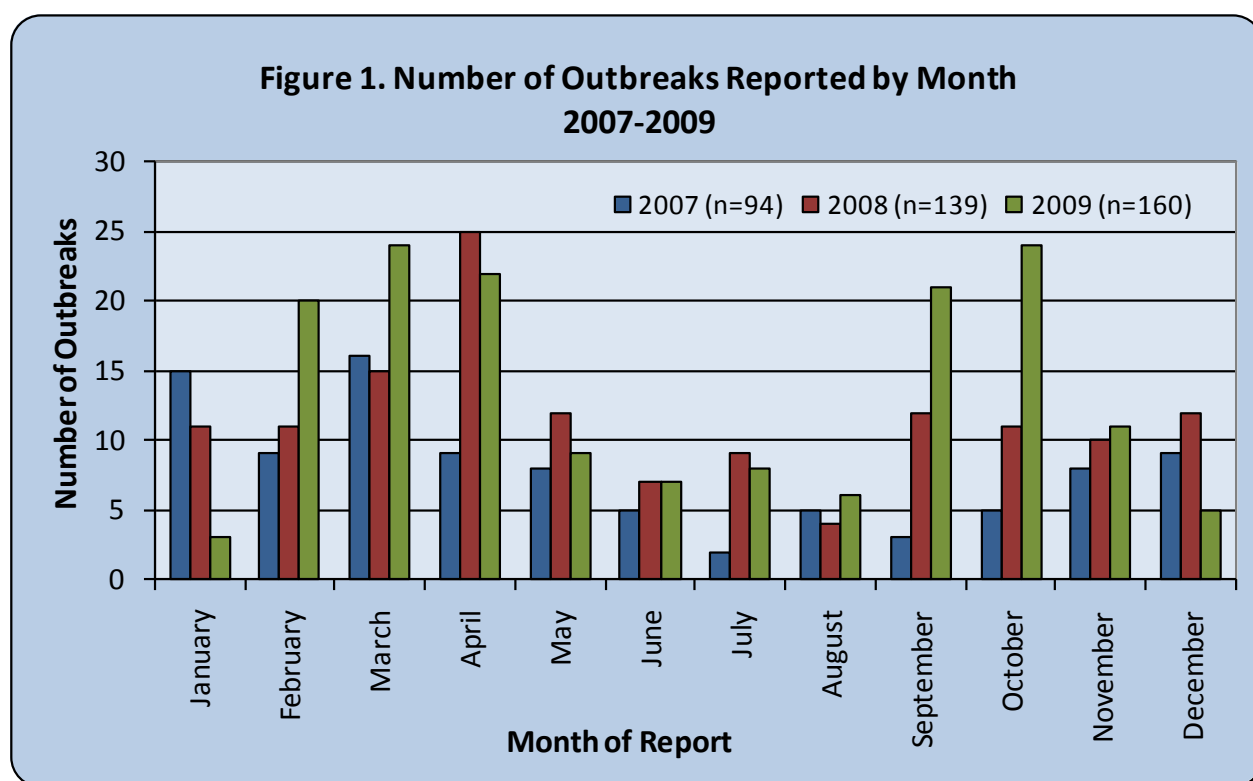
In 2009, there were 160 outbreaks investigated in Maricopa County or an average of 13.3 outbreaks per month, with the number of outbreaks peaking in March-April and again in September-October. The outbreaks ranged in size from one to 160 ill persons, with over half of the reported outbreaks affecting 15 or fewer persons. The most frequent type of outbreaks were influenza-like illness (ILI) reports. The pathogen that was most often isolated from specimens gathered from outbreaks was norovirus. Schools were the most common type of facility to report an outbreak, followed by food establishments, and then daycare facilities.

The 2009 novel H1N1 influenza pandemic began during the time period included in this report. In April 2009, a new strain of influenza began circulating throughout the world. Maricopa County received reports of cases of this novel H1N1 influenza beginning on April 27, 2009. From April 27, 2009 to December 31, 2009, there were 5,438 confirmed cases of novel H1N1 influenza reported to MCDPH. Although the worldwide pandemic was, by definition, an outbreak, the cases occurring countywide were not counted in this report as one large outbreak. However, reports of non-specific influenza-like-illness (ILI) outbreaks in schools and other facilities are included, some of which were undoubtedly clusters of novel H1N1 influenza (although not confirmed with testing). The influence of the novel H1N1 influenza pandemic will be seen repeatedly throughout the report as respiratory illnesses, especially those reported by schools, changed the pattern of reported outbreaks in 2009. For more information on the novel H1N1 influenza in Maricopa County, please see the influenza reports on the MCDPH website at www.maricopa.gov/Public_Health/epi/flu.aspx.

Analysis

In 2009, the number of monthly outbreaks ranged from three (in January) to 24 (in both March and October), with an average of 13.3 outbreaks per month. This is an increase over the previous two years. In 2008, there were 139 outbreaks, an average of 11.6 per month ranging from 4-25 per month and in 2007, there were 94, an average of 7.8 per month ranging from 2-16 per month. As shown in Figure 1, reports of outbreaks from 2007 to 2009 followed a bimodal curve, with peaks in the spring and fall months.

The increase in number of outbreaks in spring and fall were due, in part, to the seasonality of pathogens such as norovirus and influenza, as well as the influx of residents/visitors at that time of year. In addition, the high number of outbreaks reported in September and October of 2009 were elevated due to increased school reporting of ILI outbreaks. During this time, reporting was encouraged by the MCDPH and the media brought attention to the pandemic.



The median number of persons affected per outbreak in 2009 was also higher than in 2007 and 2008. In 2009 it was 12 (range: 2-160); 7 in 2008 (range: 1-110); and 8 in 2007 (range: 2-154). In 2009, 103 of the 160 outbreaks (64%) involved 20 or fewer persons (see Figure 2). Again, the increase in number of individuals per outbreak was mostly due to schools reporting large numbers of student illnesses or absences.

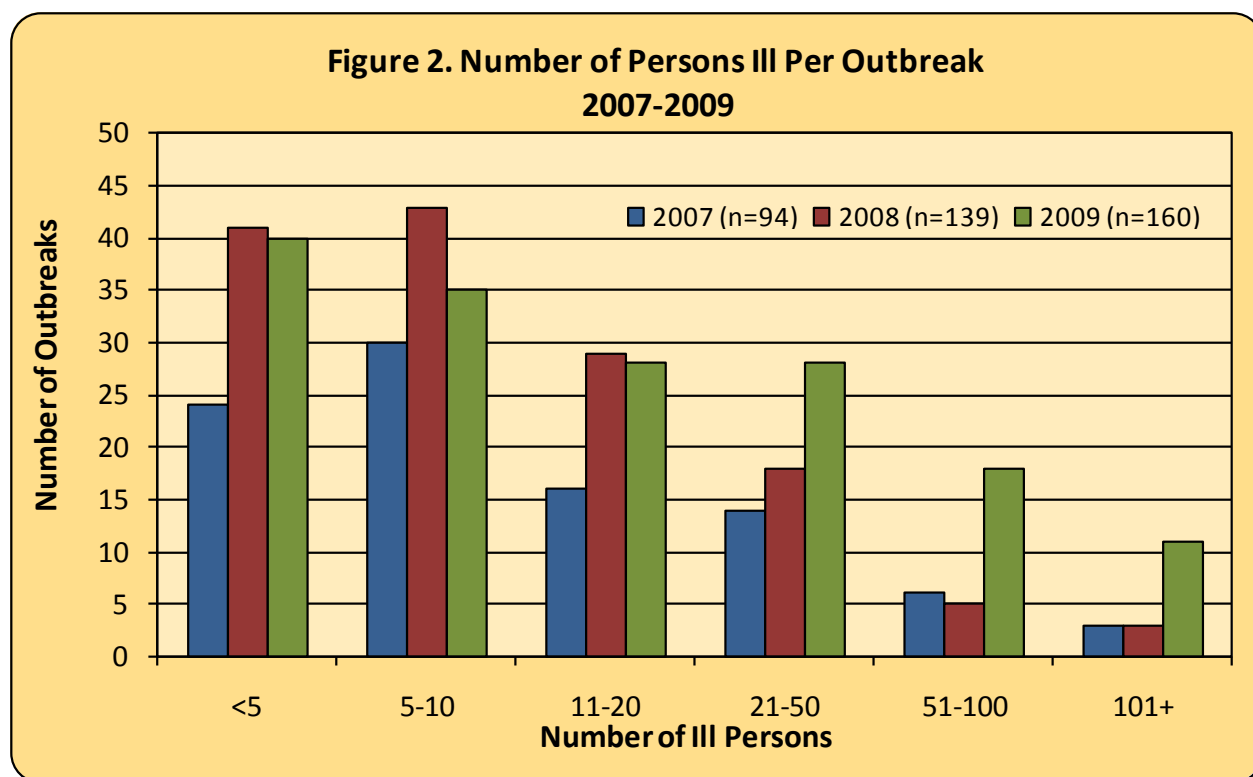


Table 2 shows the number of outbreaks by identified pathogen for the past three years. Overall, in 2009, there were 137 outbreaks for which the etiology was known (86% of the total), and 23 (14% of the total) of unknown etiology. Comparatively, in 2008, 23% of the outbreaks were of unknown etiology and in 2007, 34% were unknown. For this report, influenza-like illness outbreaks were counted as known etiology since ILI surveillance is routinely conducted as a proxy for influenza activity and influenza was known to be circulating in the community at the time. This decrease in the percent of outbreaks with unknown etiology each year may be due to better specimen collection, improved testing technology, and/or other factors. For 2009, classifying ILI outbreaks in the “known etiology” category greatly increased the overall percent of outbreaks with known etiology.

Table 2. Number of Outbreaks by Etiology			
Etiology of Outbreaks	2007	2008	2009
Known Etiology – Subtotal	62	106	137
Aseptic meningitis	0	1	0
Conjunctivitis	2	3	2
Cryptosporidiosis	1	5	0
E. coli O157:H7	0	0	1
Fifth Disease (Human Parvovirus B19)	0	1	1
Giardia	0	0	1
Hand, Foot, and Mouth Disease	2	0	1
Head Lice	2	6	0
Hepatitis A	0	0	0
Influenza	1	2	2
Influenza-like Illness	4	2	50
Mercury contamination (potential)*	0	0	1
MRSA	2	2	1
Norovirus	26	33	26
Rotavirus	0	1	0
RSV	2	2	4
Salmonella	0	2	12
Scabies	6	11	7
Shigella	1	8	10
Staphylococcus (Skin Infections)	1	0	0
Strep group A (strep throat)	0	3	5
Varicella	12	24	13
Unknown Etiology – Subtotal	32	33	23
Unknown (GI)	32	31	23
Unknown (Rash)	0	2	0
Total	94	139	160

While the specific etiology of an outbreak is not always determined, most outbreaks can be broadly classified based on the symptoms exhibited by cases. Table 3 shows that from 2007 through 2009, the most frequent outbreak type investigated by the MCDPH was gastrointestinal, although there were nearly as many respiratory outbreaks reported in 2009. The “other” category for outbreak type includes outbreaks of meningitis, conjunctivitis, and head lice.

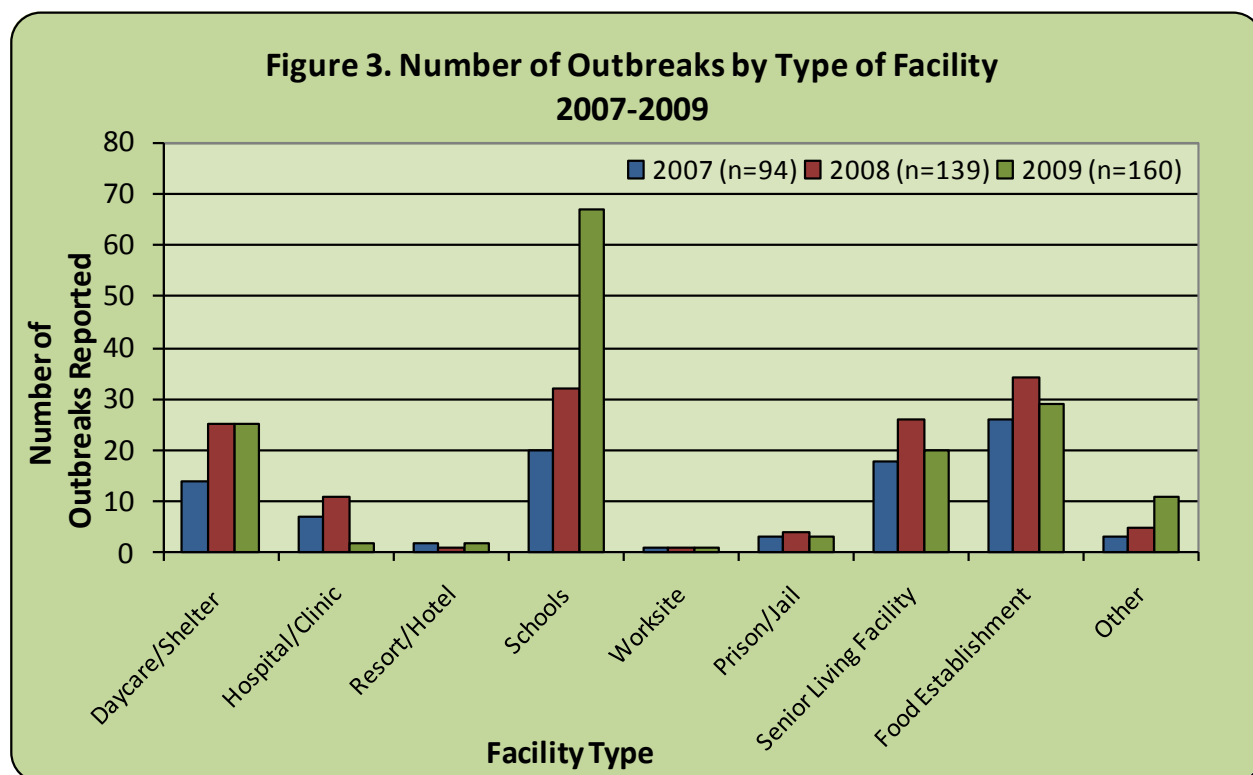
Table 3. Type of Outbreaks			
Outbreak Type	2007	2008	2009
Gastrointestinal	60	82	73
Respiratory	7	38	61
Rash	23	9	23
Other	4	10	3
Total	94	139	160

* Please see the **Special Topic: Mercury Exposure at a High School** on page 11 of this report for more details. While there was potential for contamination, none of the exposed individuals actually experienced symptoms of mercury toxicity.

Table 4 shows that the high number of outbreaks in 2009 was largely due to an increase in the number of outbreaks reported in schools. With the exception of schools and the “other” category, the number of reported outbreaks decreased in all categories. Facility types included in the “other” category includes countywide outbreaks (for which no specific facilities were identified), sports teams, and public pools.

Table 4. Number of Outbreaks by Type of Facility			
Facility Type	2007	2008	2009
Daycare/Shelter	14	25	25
Hospital/Clinic	7	11	2
Resort/Hotel	2	1	2
Schools	20	32	67
Worksite	1	1	1
Prison/Jail	3	4	3
Senior Living Facility	18	26	20
Restaurant/Food Est.	26	34	29
Other	3	5	11
Total	94	139	160

As shown in Figure 3, outbreaks in both schools and the “other” category have increased over the past three years, while the remaining facility types saw their numbers either decrease or stay the same.



The number of outbreaks by type and facility for 2009 are shown in Figure 4. Respiratory illness outbreaks were the most common type of outbreak in schools and prisons/jails. In contrast, outbreaks reported in daycares/shelters, hospitals/clinics, resorts/hotels, senior living facilities, and food establishments were more likely to be gastrointestinal illness outbreaks. There were also outbreaks of rashes reported in schools, daycares/shelters, worksites, and senior living facilities. The most common type of rash outbreak in these facilities was varicella (chickenpox).

Figure 4. Number of Outbreaks by Type and Facility Reported in 2009 (n=160)

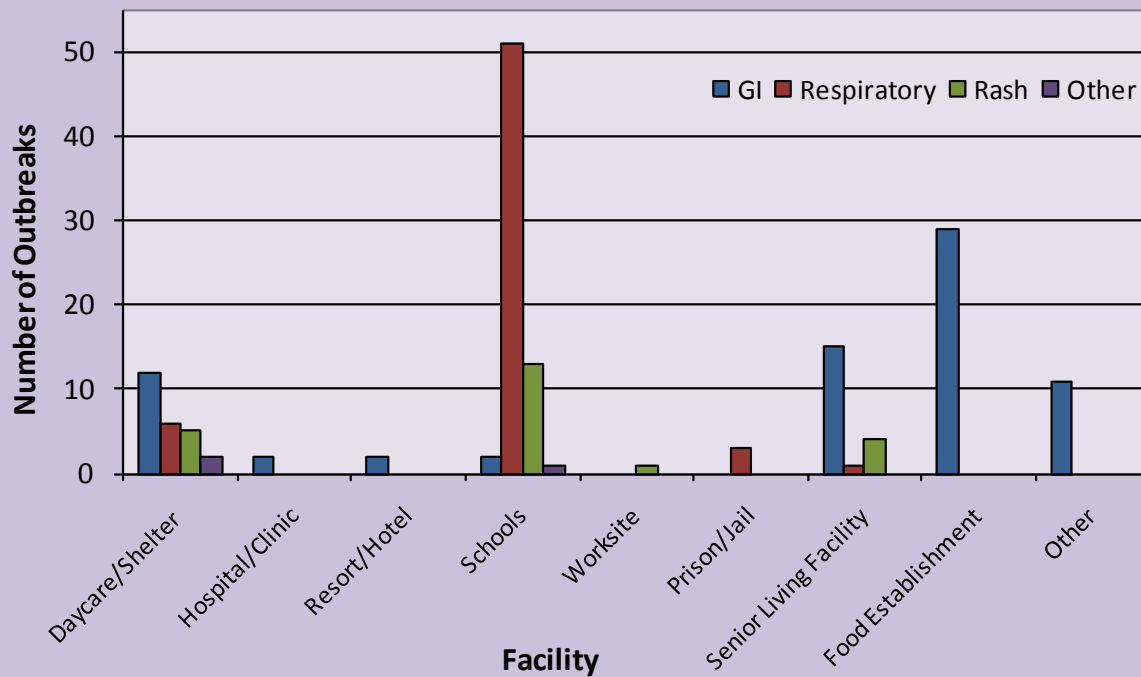


Figure 5 illustrates GI outbreaks in 2009 by type of facility. Among the 73 gastrointestinal outbreaks reported in 2009, food establishments made up the largest percentage at 38%, followed by senior living facilities at 21%, and then daycare centers/shelters at 16%. Please note that many outbreaks attributed to food establishments (i.e., the reporter became ill after eating at a restaurant) are found to be either person-to-person spread or inconclusively attributed to the food establishment.

Figure 5. Percentage of GI Outbreaks by Facility 2009 (n=73)

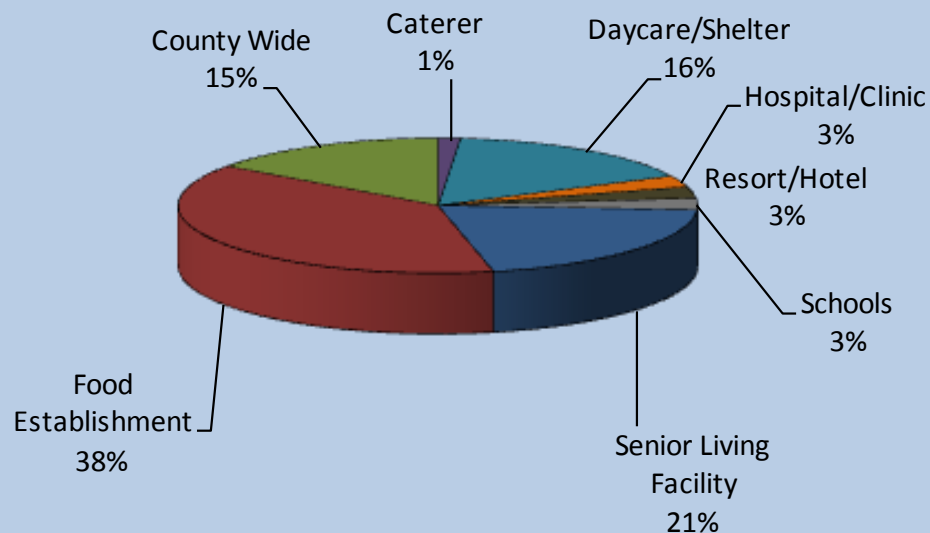
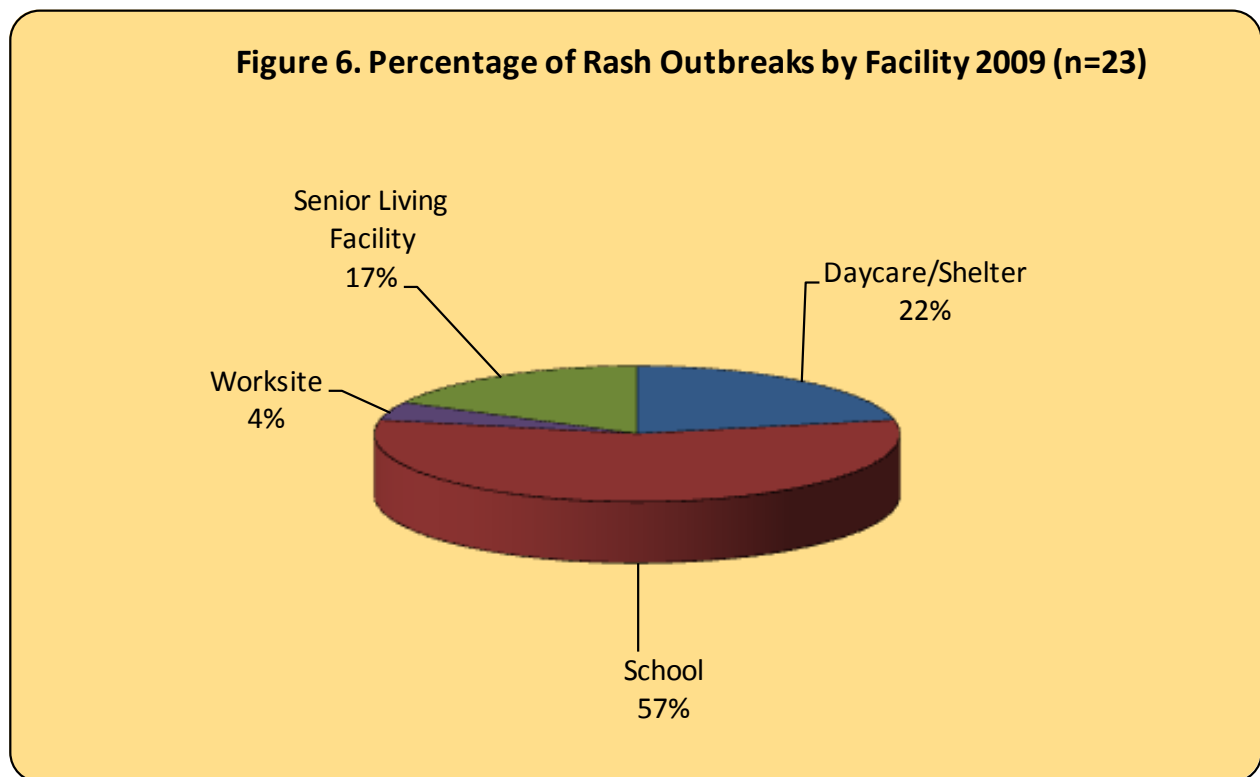
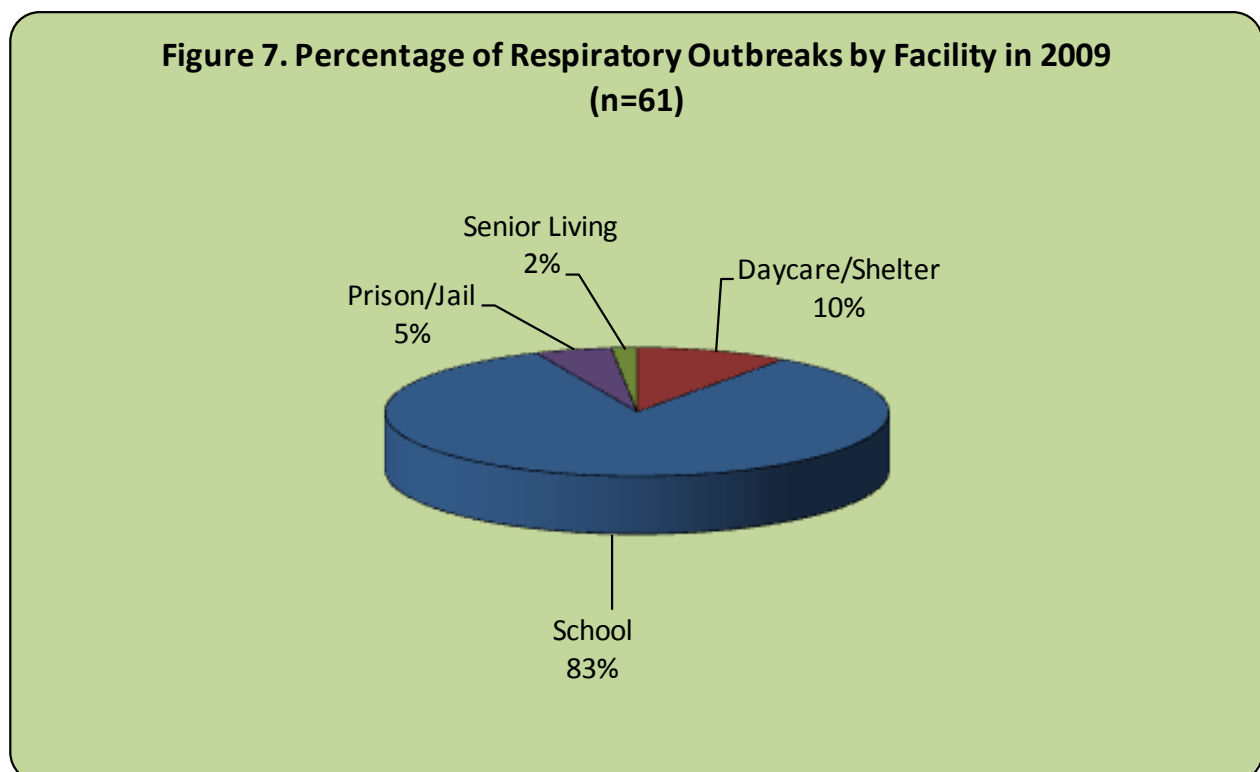


Figure 6 shows rash outbreaks by facility type for 2009. Schools (57%) and daycare/shelters (22%) had the majority of rash outbreaks. All of the rash outbreaks at senior living facilities were scabies.



In Figure 7, respiratory outbreaks by facility for 2009 are shown. The majority of these outbreaks (83%) were reported by schools. This was likely influenced by the media attention and requests from the public health community for schools to report ILI cases during the novel H1N1 influenza pandemic.

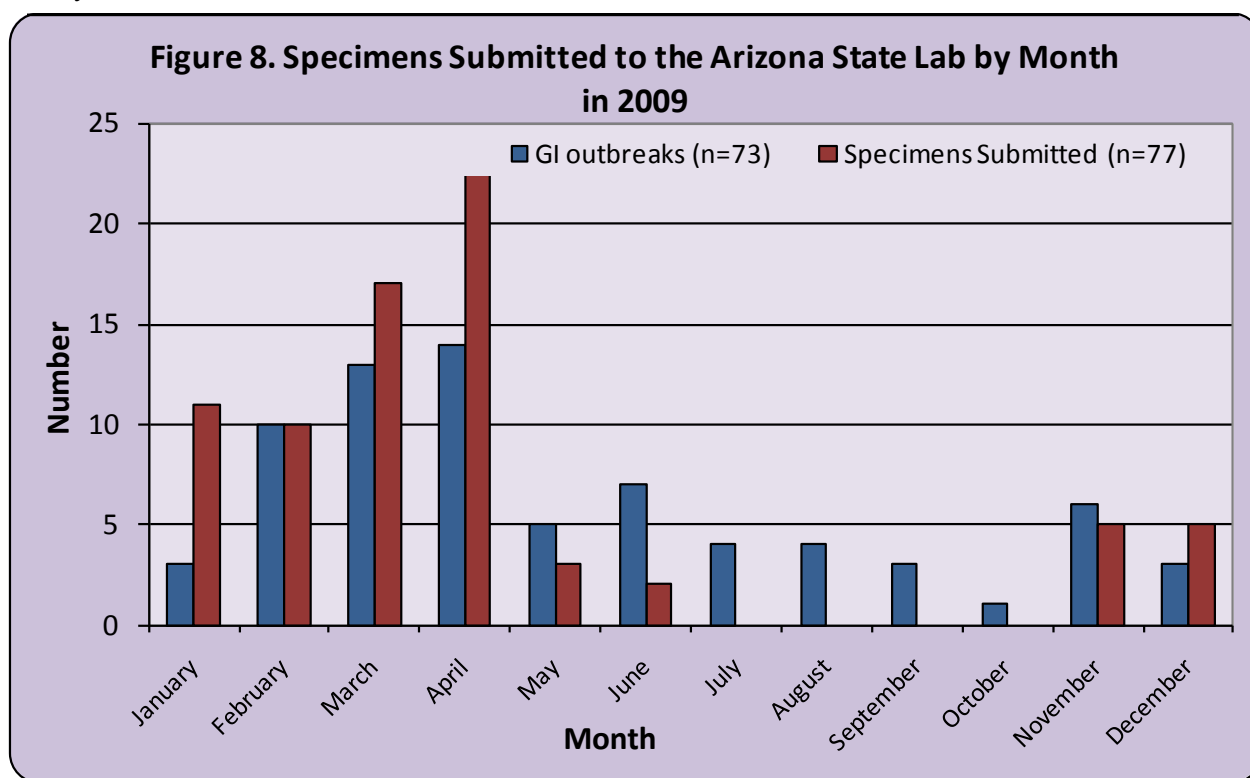


Specimens

Collecting stool specimens from ill individuals is essential in identifying the etiology of gastrointestinal outbreaks. MCDPH was able to collect one or more specimens for 58 of the 73 gastrointestinal outbreaks in 2009. This is at least one specimen for 79% of the GI outbreaks. A total of 77 stool specimens were collected for these 58 outbreaks; this is an average of 1.3 specimens per outbreak.

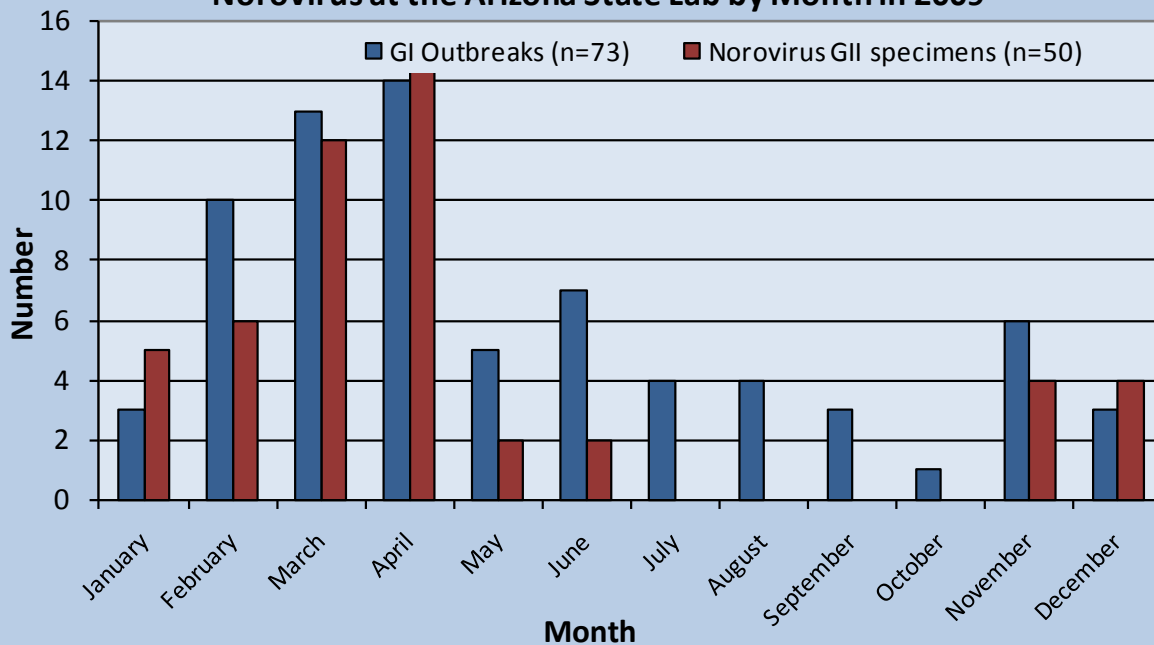
Specimens were not collected for 15 of the 73 GI outbreaks for several reasons including: too much time had elapsed between an event and the report of illness (thereby making it difficult to find a pathogen in the stool), some individuals were unwilling to provide specimens, and some individuals could not be contacted.

There were 95 specimen collection kits provided by MCDPH to ill individuals, with a range of 1-5 kits per outbreak. Of the 95 kits sent out, 64 (66%) of the recipients returned stool specimens for analysis. These specimens were submitted for testing at the Arizona State Laboratory (ASL). An additional 13 specimens were collected at facilities such as hospitals and long-term care facilities and forwarded to ASL, without using kits provided by MCDPH. This resulted in a total of 77 specimens that were submitted for testing at ASL. Figure 8 shows the distribution of specimens submitted and tested at ASL in 2009 by month.



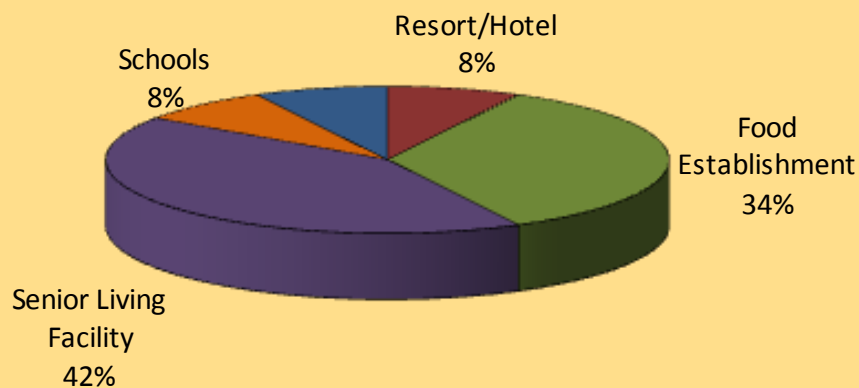
Of the 77 stool specimens submitted to ASL for testing, 74 (96%) were tested for norovirus alone or norovirus and other pathogens, two (3%) were tested only for bacterial pathogens, and one (1%) specimen was lost at the lab. Among the 74 specimens tested for norovirus, 14 specimens were also tested for bacterial pathogens (*E. coli*, *Campylobacter*, *Shigella*, and *Salmonella*), and two additional specimens were tested for both cryptosporidium and norovirus. In total, there were 50 specimens that were positive for norovirus (all typed as GII), none that were positive for bacterial pathogens, none that were positive for cryptosporidium, 26 specimens that did not have a positive test for any pathogen, and one that was lost prior to testing. MCDPH also received reports of positive specimens collected by health care providers that were tested at commercial laboratories. This resulted in the identification of 74 *Salmonella*, 46 *Shigella*, and two *E. coli* 0157:H7 cases. Figure 9 shows the distribution of GI outbreaks and positive norovirus specimens by month.

Figure 9. Total Number of Specimens that Tested Positive for Norovirus at the Arizona State Lab by Month in 2009

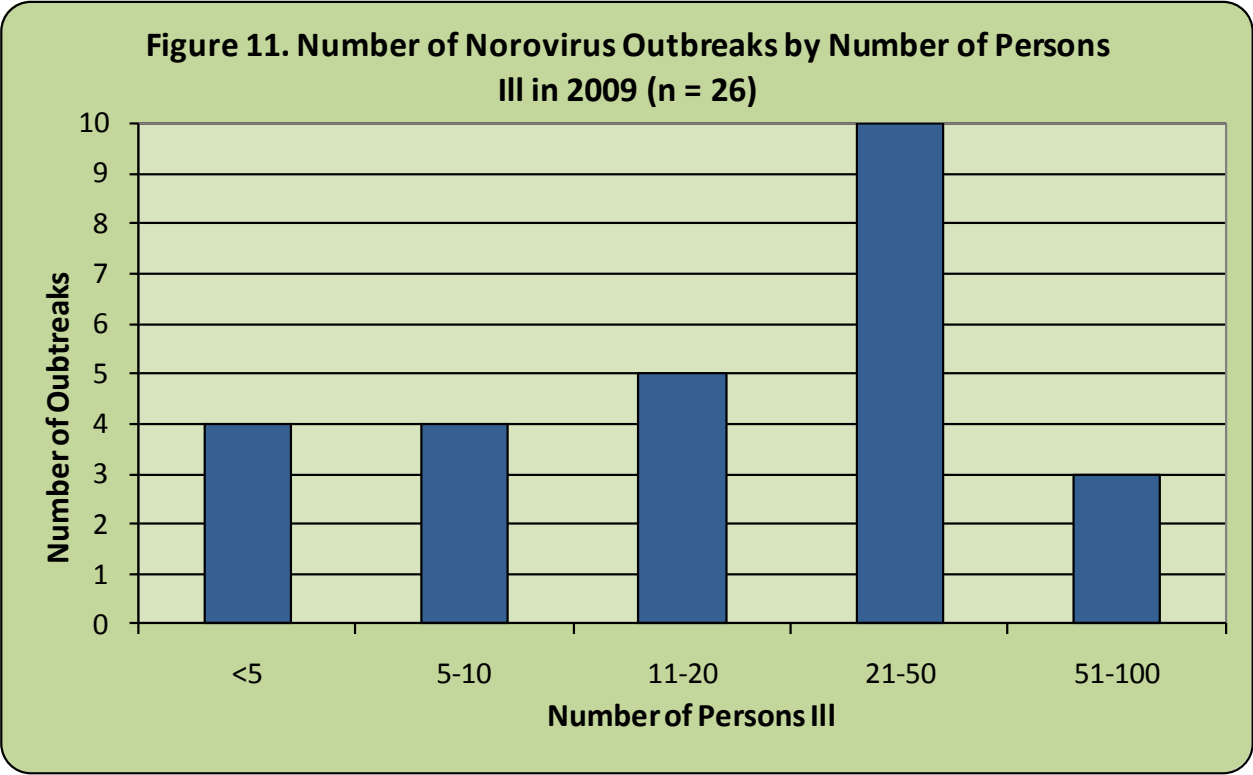


Outbreaks of norovirus occurred in all types of facilities, but most commonly in senior living facilities and food establishments, shown in Figure 10. The distribution of positive norovirus outbreaks by facility observed in Figure 10 is somewhat different from the distribution of total gastrointestinal outbreaks by facility in Figure 5, which showed restaurant/food establishments as most common followed, by senior living facilities. This may reflect that it is often easier to collect stool specimens from senior living facilities than from patrons of restaurants reporting an outbreak.

Figure 10. Number of Positive Norovirus Outbreaks by Facility in 2009 (n=26)



The number of reported norovirus outbreaks by number of persons ill are shown in Figure 11. The majority of outbreaks (69%) affected more than 10 individuals, with three occurring in groups of more than 50 individuals.



Special Topic: Mercury Exposure at a High School

In February 2009, MCDPH was informed that a mercury exposure had occurred at a high school located in Maricopa County. There were 55 students exposed to mercury, which had been obtained by several students from a classroom, and then shared with others. Local fire departments, hazardous material crews, and officials from the Environmental Protection Agency (EPA) evaluated the school campus as well as the students’ clothes and homes for mercury contamination. EPA staff members carried out remediation of contaminated sites. With the aid of students from the University of Arizona School of Public Health Student Aid for Epidemiology Response (SAFER) program, MCDPH staff contacted 55 students reported by the school as having mercury exposure and administered questionnaires. These questionnaires evaluated each individuals’ type of exposure and if they were experiencing any symptoms of mercury toxicity. There were 32 interviews completed and none of the students were identified as having symptoms of mercury toxicity.

For this report, the mercury exposure incident was counted as an outbreak. Cases were considered to be those exposed to mercury (not persons exhibiting symptoms of mercury toxicity - of which there were none). For classifying the type of outbreak, the exposure was counted in the “other” category.

Discussion

The following conclusions and implications are based on the findings presented in this report:

- Due to the 2009 novel H1N1 influenza pandemic, at many points during the year, respiratory outbreaks dominated MCDPH's investigation activities.
- Norovirus was the most prevalent pathogen that was positively identified as contributing to illness outbreaks. Given the prevalence of norovirus in outbreaks and presumably in the community, more effort should be expended on preventive measures.
- In 2009, outbreaks most commonly occurred where people were congregated for long periods each day – long-term care facilities, schools, etc. Appropriate control measures should be encouraged in these settings and include proper hand washing, routine clean-up of areas at risk of contamination, removal of shared items (especially in a classroom setting), use of chlorine based cleaners, isolating ill persons to limit transmission, and ensuring that all food handlers with diarrhea or vomiting are excluded from work.
- Since 2005, the percent of outbreaks with an unknown etiology has decreased and MCDPH intends to collect specimens for as many outbreaks as possible in order to maintain this trend. As bacterial pathogens are very rarely isolated during testing of stool specimens, bacterial testing should be limited only to instances where evidence for a bacterial pathogen exists (e.g. when a case has bloody stools or the incubation period is consistent with a bacterial pathogen).
- Since 2003, there has been a steady rise in the number of outbreaks each year – a 290% increase when comparing 2009 to 2003. Additional resources are needed in order for MCDPH to adequately investigate each outbreak. The number of uninvestigated outbreaks will likely increase annually if appropriately trained staff members are not added.
- The onset of the 2009 novel H1N1 influenza pandemic occurred concurrently with gastrointestinal, rash, and other outbreaks. It is clear that more resources are needed not only to handle routine gastrointestinal outbreaks, but also for unexpected outbreaks associated with emerging and/or pandemic diseases.